Lethe eurydice (Johansson) and *L. fumosus* (Leussler), Sibling Species (Lepidoptera: Satyridae)

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Abstract: *Lethe eurydice* (Johansson), 1763, a Nearctic butterfly, has heretofore been considered a single species with four subspecies. However, two of its supposed subspecies fly at the same time and in close proximity, but they occur in different environments and have constant superficial differences. The conclusion is reached that they are sibling species and probably have different food plants. The names recognized for them are *Lethe eurydice* (Johansson) and *L. fumosus* (Leussler), 1916.

In the current Synonymic List of the Nearctic Rhopalocera (dos Passos, 1964, p. 99), *Lethe eurydice eurydice* (Johansson), 1763, *L. e. transmontana* (Gosse), 1840, *L. e. fumosus* (Leussler), 1916, and *L. e. appalachia* R. L. Chermock, 1947, are treated as one species with four recognizable subspecies; four synonyms and one form. There is now good reason to believe that this was an error carried over from earlier checklists and that two sibling species are involved, hereinafter referred to as *eurydice* and *fumosus*. A brief review of all names will be given under the respective synonymies.

This problem is somewhat similar to that pointed out by Rawson and Ziegler (1950, p. 74) that two species of *Mitoura* had been included in the species *gryneus* Hübner, "1816" [1819], and they described the second species as *hesseli*. In that case it was found that the food plant of *gryneus* is Virginia cedar, which grows in dry ground, and that of *hesseli* is white cedar, which is found in swampy areas. Both species are so close in appearance that their slight differences had passed unnoticed thus far. In the present problem we have species that are not quite so similar yet have not been detected as different heretofore.

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Klots (1951, p. 68) has written concerning *Lethe eurydice appalachia* (= *fumosus*) as follows: ". . . West Virginia to Georgia in the mountains, to northern Florida (swamps?), not typical in piedmont in the South; darker ground color, coloration less contrasty, postmedian band straighter, less jagged and irregular." Since that publication, Muller (1968, p. 304) has recorded *eurydice* (*recte appalachia* = *fumosus*) from New Jersey, which extends its range considerably northward, while this paper extends its range farther northwest to Nebraska.

Interesting facts about the discovery of *fumosus* in New Jersey by Muller and Frank Rutkowski are that while *eurydice* and *fumosus* fly at the same time in close proximity to each other, they are found in different environments, the former occurring in open meadows, sometimes wet or dry and even on dry hillsides, while the latter is restricted to boggy or swampy areas close to or in open woods. This, coupled with the differences in appearance of the two insects as pointed out by Klots (1951), leads the present author to believe that two distinct but closely related species are involved and to suggest the following synonymies:

Lethe eurydice (Johansson)

Papilio eurydice Johansson
1763 Amoen. Acad., vol. 6, p. 406, no. 65
Type locality: Philadelphia
Type deposited: collection De Geer, probably destroyed

?*Papilio canthus* Linnaeus
1767 Systema Naturae, 12th ed., vol. 1, p. 768, no. 129
Type locality: America septentrionale
Type deposited: not in Linnean Society, probably destroyed

?*Satyrus cantheus* Godart
"1819" [1824] Encyclopédie Méthodique, vol. 9, p. 493, no. 56
Type locality: l'Amerique septentrionale
Type deposited: not in Paris Museum, probably never existed

?*Hipparchia transmontana* Gosse
1840 Canadian Naturalist, p. 247, 1 fig.
Type locality: Compton, Quebec
Type deposited: not in Canadian National Collection nor in British Museum (Natural History), probably destroyed

Hipparchia boisduvali Harris (*emendatio*)
1862 Insects Inj. to Veg., p. 305, fig. 128
Type locality: northwestern Massachusetts
Type deposited: not in Museum of Comparative Zoology, probably destroyed

Satyrodes eurydice transmontana ♀ form *rawsoni* Field
1936 Pomona Jour. Ent. & Zool., vol. 28, p. 22
Type locality: Bloomfield, Michigan, August 12, 1928
Type deposited: U. S. National Museum

The types of *eurydice*, *canthus*, *cantheus*, *transmontana* and *boisduvali* are difficult to trace. The two first might be expected to be in the Linnean collection, but Verity (1913, pp. 173–190), who studied that collection carefully, did not

report finding either of them. This author also examined that collection in 1937 with the same result. The type of *cantheus* according to Dr. Pierre Viette is not in the Paris Museum, as he has kindly advised the author (*in litt.*). The type of *transmontana* is not in the Canadian National Collection according to Dr. Thomas N. Freeman who kindly searched for it nor is it in the British Museum (Natural History) according to Mr. T. Graham Howarth who did likewise. The Thaddeus W. Harris collection is in the Museum of Comparative Zoology but does not contain the type of *boisduvali* according to Dr. Howard E. Evans who kindly looked for it. Presumably all of these types are lost or destroyed.

The upperside of the wings of *eurydice* are a pale brown in the basal and discal areas. The limbal area is much lighter so that the wings are contrasty, thus making the submarginal rows of spots on both primaries and secondaries stand out prominently. On the underside of both wings, the colors are paler with similar results. The postmedian band on both wings is outlined by narrow lines of darker color. The outer lines of this band are irregular and show some sharp points. This is especially true near the anal angle of the secondaries. The ocelli on both wings consist of a white pupil in a black ground which is set in a light buff circle surrounded by another of paler buff. Good comparative figures of *eurydice* and *fumosus* will be found in Leussler (1916, figs. 1–4).

There were early differences of opinion as to the proper name to use for the eyed brown butterfly, and unfortunately such differences still exist. However, the name in general use at present is *eurydice*. In the synonymy of *eurydice* there is usually placed *canthus, cantheus, transmontana,* and *boisduvali*, although Harris (1862, p. 306), in proposing the latter name, claimed that both *canthus* and *cantheus* referred to another insect. He does not appear to have been aware of the names *eurydice* and *transmontana*. Harris' objection to *canthus* and *cantheus* was that there was no mention in the original descriptions of "eye-spots" on the upperside. If his objection is valid, *eurydice* would be ruled out also. But this author is not inclined to discard a name that has been in general use since at least 1926. He has, however, questioned both *canthus* and *cantheus* in the synonymy. If *eurydice* must eventually be replaced, the inadequately described and, also, questioned in the synonymy *transmontana* as a junior subjective synonym would take its place; before this is done, an application should be made to the International Commission on Zoological Nomenclature to conserve *eurydice*.

Compton, Quebec, the type locality of *transmontana*, is a small village near which Gosse had a farm and taught school during the winter. This information was offered by Dr. Freeman, who also kindly furnished a small series of *eurydice* from Georgeville and Waterville between which Compton lies.

It should be noted that the original spelling "*boisduvallii*" of Harris' was erroneous; Boisduval wrote his name with one "l" only. It has been emended in

this paper to read *boisduvali*. Harris' description and figure of this insect are adequate.

Morris (1862, p. 75, no. 6) ascribes *cantheus* (not *canthus*) to Fabricius, but the reference is incorrect as Fabricius never used that name. The first author to use *cantheus* was Godart in 1824, so the name must be ascribed to him. He too refers the name to Fabricius. The only apparent differences between *canthus* and *cantheus* according to Godart is that the former has four ocelli on the underside of the primaries and five on the secondaries, while the latter has three small indistinct ocelli on the underside of the primaries and six, the fifth very large and the sixth very small, at the anal angle. Such variations in spots are well known in species of Satyridae. It is this author's conclusion that these names are synonymous. Strictly interpreted, neither description applies very well to *eurydice* any more than Johansson's does.

The authorship of *eurydice* and *boisduvali* has fluctuated between Linnaeus and Johansson for the former and Morris and Harris for the latter. The paper in which the name *eurydice* was proposed was a thesis written by Johansson although published by Linnaeus, and this name has been ascribed to the former. In the case of *boisduvali*, the name was published by both Morris and Harris in the same year. But Morris' use of *boisduvali* was in the synonymy of *canthus*, a method of publication no longer considered valid under the Code. Therefore, *boisduvali* is ascribed to Harris who gave a good description and a figure of the insect.

Lethe fumosus (Leussler), new combination

Satyrodes canthus Linnaeus, n. v. *fumosus* Leussler
1916 Ent. News, vol. 27, p. 99, pl. IV, figs. 1, 2
Type locality: Sarky County, Nebraska
Type deposited: Ohio State University
Satyrodes canthus ab. *boweri* F. H. Chermock
1927 Bull. Bklyn. Ent. Soc., vol. 22, p. 119
Type locality: Port Hope, Ontario, July 29, 1921
Type deposited: Carnegie Museum
Lethe (*Enodia*) *eurydice appalachia* R. L. Chermock
1947 Ent. News, vol. 58, p. 33
Type locality: Conester Falls, near Brevard, North Carolina, June 27, 1941
Type deposited: Collection of the author

While Leussler described *fumosus* as a new variety, the name was given subspecific standing by McDunnough (1917, p. 6, no. 100a) and has been so used ever since. The types of *fumosus*, ab. *boweri*, and *appalachia* are all in existence and accounted for in the synonymy listed above.

The upperside of the wings of *fumosus* is brown, especially on the males. There is little contrast between the limbal area and other parts of the wings, but there is more contrast in the females than in the males. Thus the rows of ocelli on both primaries and secondaries do not stand out prominently, especially not

on the upperside. On the underside of the primaries and secondaries, the lines bounding the postmedian band are straighter, and the basal line seems to terminate before the anal angle. The ocelli on both wings consist of a white pupil in a black ground which is set in a yellow circle surrounded by another of brown.

Leussler wrote in his original description: "The habitat of this variety is a spring-fed marsh . . . where wild rice, rushes and tall coarse grasses flourish," and added, "It seems quite probable that this form of *canthus* has been developed as a result of geographical isolation." From this it may be gathered that Leussler himself considered his variety as synonymous with subspecies. This insect is found in partly wooded bogs and swamps and not in dry, open fields. Its preferred food plant is probably a species of rough grass or sedge.

Since *fumosus* and *appalachia* occur at opposite ends of a cline, there appears to be no reason for not using both in a varietal sense; minor differences must exist between them.

As a result of this study the following arrangement of the names in checklist form is proposed:

eurydice (Johansson), 1763
- a) *e. eurydice* (Johansson), 1763
  - ?*canthus* (Linnaeus), 1767
  - ?*cantheus* (Godart), "1819" [1824]
  - *boisduvali* Harris, 1862 (*emendatio*) *boisduvallii* Harris, 1862
- b) ?*e. transmontana* (Gosse), 1840 form ♀ *rawsoni* (Field), 1936

fumosus (Leussler), 1916
- *canthus* Boisduval & Le Conte, "1833" [1834] (*nec* Linnaeus, 1767, *nec* Fabricius, 1775)
- a) *f. fumosus* (Leussler), 1916
  - ab. *boweri* (F. H. Chermock), 1927
- b) *f. appalachia* R. L. Chermock, 1947

The *Satyrus canthus* of Boisduval & Le Conte, although only figured, is not the *canthus* of Linnaeus or Fabricius because of the presence of ocelli on the upperside of both wings, but it is the *fumosus* of Leussler and a good figure of that species. We do not know to whom those authors would have ascribed the name if they had published any letter press for that plate.

The life history of *eurydice* as *Satyrodes canthus* will be found in Scudder's *Butterflies of the Eastern United States* (1889, vol. 1, pp. 193–198) and in Edwards' *Butterflies of North America* (1890, vol. 3, pp. 193–202, pl. *Satyrodes* I). These may involve also the life history of *fumosus*, since these species thus far have been considered conspecific, but it is impossible to tell unless one has a description of the females that laid the eggs or of the environment in which they were taken. Doubtless when fully studied, slight differences will be found in the preparatory stages of *eurydice* and *fumosus*—they may even hybridize—and most probably they feed on different species of grasses due to the different environments in which they are found.

The genitalia of *eurydice* and *fumosus* are substantially similar, although long series of dissections might show minor differences. This fact is not surprising because there is no apparent difference between the genitalia of the two other Nearctic species of butterflies presently referred to *Lethe*, although superficially they are quite distinct in appearance.

The distribution of *eurydice* is somewhat wider than that of *fumosus*. It extends from Manitoba, Ontario, and Quebec south to Colorado and east of the Rocky Mountains to Georgia and Florida. On the other hand, *fumosus* has a more restricted range from Nebraska southward to Georgia and northern Florida. Doubtless both ranges have been somewhat confused by the failure of collectors to properly determine their specimens.

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